Listing of Claims

1. (Currently Amended) A computer-executable method of coupling multiple independent reservoir and network simulators simulations with a controller comprising:

providing an open message-passing interface that communicates with black oil model reservoir simulators simulations, compositional model reservoir simulators simulations, and different types of surface network simulators simulations;

initiating a first reservoir simulation on a first simulator for one or more physical parameters of a first reservoir, the first reservoir simulation using a first fluid model;

initiating a second reservoir simulation on a second simulator for the one or more physical parameters of a second reservoir, the second reservoir simulation using a second fluid model;

initiating a network simulation on a network simulator to model a network for coupling the first reservoir and the second reservoir to a surface facility;

selecting maximum synchronization intervals to limit controller time steps;

defining network balancing times based on the controller time steps;

applying the controller time steps via the open message-passing interface to the advancement through time of the first reservoir simulator simulation, the second reservoir simulator simulation, and the network simulator simulation, each controller time step enabling the first reservoir simulator simulation, the second reservoir simulator simulation, and the network simulator simulation to each take a different an independent number of non-identical time steps to advance to the start of a next controller time step;

varying the duration of the controller time steps in response to a production rate or an injection rate of the first reservoir simulator ~~simulation~~ or the second reservoir simulator ~~simulation~~;

translating via the open message-passing interface each of a first hydrocarbon fluid stream of the first reservoir simulator ~~simulation~~ and a second hydrocarbon fluid stream of the second reservoir simulator ~~simulation~~ to a common fluid model ~~of the controller by converting pseudo-components of each of the first hydrocarbon fluid stream and the second hydrocarbon fluid stream to a super-set of pseudo-components used in the first reservoir simulation and the second reservoir simulation~~; and

initiating network balancing among the simulators at a corresponding point in each controller time step.

2.   (Currently Amended) A controller for coupling multiple independent reservoir and network simulators ~~simulations~~ comprising:

means for interfacing via open message-passing with different types of simulation tasks each using an independent simulator including black oil model reservoir simulations, compositional model reservoir simulations, and different types of surface network simulations;

means for initiating a first reservoir simulation on a first simulator using a first simulation model for one or more physical parameters of a first reservoir, the first reservoir simulation using a first fluid model;

means for initiating a second reservoir simulation on a second simulator using a second simulation model for the one or more physical parameters of a second reservoir, the second reservoir simulation using a second fluid model;

means for initiating a network simulation on a third simulator using a third simulation model to model a network for coupling the first reservoir and the second reservoir to a surface facility;

means for selecting a maximum synchronization time to define controller time steps and network balancing times based on the controller time steps, the controller time steps being independent of the respective time steps of the independent simulation models;

means for applying the controller time steps to the advancement through time of the first reservoir simulation, the second reservoir simulation, and the network simulation, each controller time step enabling the first reservoir simulation, the second reservoir simulation, and the network simulation to each take ~~a different~~ an independent number of non-identical time steps to advance to the start of a next controller time step;

means for dynamically adjusting the duration of the controller time steps when a production or injection rate in one of the simulations changes beyond a selected threshold;

means for translating each of a first hydrocarbon fluid stream of the first reservoir simulation and a second hydrocarbon fluid stream of the second reservoir simulation to a common fluid model of the controller ~~by converting pseudo-components of each of the first hydrocarbon fluid stream and the second hydrocarbon fluid stream to a super-set of pseudo-components used in the first reservoir simulation and the second reservoir simulation; and~~

means for network balancing at a corresponding point in each of the controller time steps; and

means for running the first reservoir simulation, the second reservoir simulation, and the network simulation as slave processes of the controller.

3.   (Previously Presented) The controller of claim 2 additionally comprising means for balancing the coupled reservoir simulations, including means for apportioning global production and injection rates between the

simulation tasks of the first reservoir simulation and the second reservoir simulation.

4.   (Previously Presented) The controller of claim 3 additionally comprising means for balancing the coupled reservoir simulations and the surface network, including means for balancing the surface network with the global production and injection rates apportioned between the simulation tasks of the first reservoir simulation and the second reservoir simulation.

5.   (Canceled)

6.   (Previously Presented)   The controller of claim 2, wherein the means for initiating the first reservoir simulation initiates a first reservoir simulation that comprises a black oil model and the means for initiating the second reservoir simulation initiates a second reservoir simulation that comprises a compositional model.

7.   (Previously Presented)   The controller of claim 2, further comprising means for coupling additional reservoir simulations in addition to the first reservoir simulation and the second reservoir simulation, wherein the additional reservoir simulations run a mixture of black oil models with different sets of active phases and compositional models with different sets of pseudo-components.

8.   (Previously Presented)   The controller of claim 2, wherein the first reservoir simulation, the second reservoir simulation, and the network simulation run on different computing platforms as slave tasks to the controller.

9.   (Previously Presented)   The computer-executable method of claim 1 additionally comprising:

balancing the coupled reservoir simulations, including apportioning global production and injection rates between the simulation tasks of the first reservoir simulation and the second reservoir simulation.

10. (Previously Presented) The computer-executable method of claim 1 additionally comprising:

balancing the coupled reservoir simulations and a surface network, including balancing the surface network with the global production and injection rates apportioned between the simulation tasks of the first reservoir simulation and the second reservoir simulation.

11. (Previously Presented) The computer-executable method of claim 1, wherein initiating the first reservoir simulation comprises initiating a first reservoir simulation that comprises a black oil model and wherein initiating the second reservoir simulation comprises initiating a second reservoir simulation that comprises a compositional model.

12. (Previously Presented) The computer-executable method of claim 1, further comprising:

coupling additional reservoir simulations in addition to the first reservoir simulation and the second reservoir simulation, wherein the additional multi-platform reservoir simulations run a mixture of black oil models with different sets of active phases and compositional models with different sets of pseudo-components.

13. (Previously Presented) The computer-executable method of claim 1, wherein the first reservoir simulation and the second reservoir simulation are run on different computing platforms as slave processes to a controller process

balancing the slave processes and dynamically varying controller time steps of the slave processes.

14. (Currently Amended) A computer readable storage medium containing instructions, which, when executed by a <u>controller</u> ~~computer~~, perform a process comprising:

interfacing via open message-passing with different types of simulation tasks <u>on independent simulators</u> including black oil model reservoir simulations, compositional model reservoir simulations, and different types of surface network simulations;

initiating a first reservoir simulation <u>on a first simulator using a first simulation model</u> for one or more physical parameters of a first reservoir, the first reservoir simulation using a first fluid model;

initiating a second reservoir simulation <u>on a second simulator using a second simulation model</u> for the one or more physical parameters of a second reservoir, the second reservoir simulation using a second fluid model;

initiating a network simulation <u>on a third simulator using a third simulation model</u> to model a network for coupling the first reservoir and the second reservoir to a surface facility;

selecting a maximum synchronization duration to define controller time steps and network balancing times based on the controller time steps<u>, the time steps independent of the first, second, and third independent simulation models</u>;

applying the controller time steps to the advancement through time of the first reservoir simulation and the second reservoir simulation <u>and the network simulation</u>, each controller time step enabling different simulation tasks to each take ~~a different~~ <u>an independent</u> number of non-identical time steps to advance to a next controller time step; and

dynamically varying the duration of the controller time steps in response to a production rate or an injection rate of the first reservoir simulation or the second reservoir simulation.

15. (Currently Amended) The computer readable storage medium of claim 14, further comprising instructions for ~~which, when executed by the computer, perform a process comprising:~~

translating each of a first hydrocarbon fluid stream of the first reservoir simulation and a second hydrocarbon fluid stream of the second reservoir simulation to a common fluid model ~~of the controller by converting pseudo-components of each of the first hydrocarbon fluid stream and the second hydrocarbon fluid stream to a super-set of pseudo-components used in the first reservoir simulation and the second reservoir simulation~~; and

balancing the network simulation at corresponding points of each controller time step.

16. (Previously Presented) The computer readable storage medium of claim 14, further comprising instructions which, when executed by the computer, perform a process comprising:

balancing the coupled reservoir simulations, including apportioning global production and injection rates between the simulation tasks of the first reservoir simulation and the second reservoir simulation.

17. (Previously Presented) The computer readable storage medium of claim 14, further comprising instructions which, when executed by the computer, perform a process comprising:

balancing the coupled reservoir simulations and the surface network simulation, including balancing the surface network simulation with the global

production and injection rates apportioned between the simulation tasks of the first reservoir simulation and the second reservoir simulation.

18.   (Previously Presented)   The computer readable storage medium of claim 16, wherein initiating the first reservoir simulation comprises:

   initiating a first reservoir simulation that comprises a black oil model and wherein initiating the second reservoir simulation comprises initiating a second reservoir simulation that comprises a compositional model.

19.   (Previously Presented)   The computer readable storage medium of claim 16, further comprising instructions which, when executed by the computer, perform a process comprising:

   coupling additional reservoir simulations in addition to the first reservoir simulation and the second reservoir simulation, wherein the additional reservoir simulations run a mixture of black oil models with different sets of active phases and compositional models with different sets of pseudo-components.

20.   (Previously Presented)   The computer readable storage medium of claim 16, wherein the first reservoir simulation and the second reservoir simulation run on different computing platforms as slave processes to a master controlling process.